

any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(d) *Oxygen interference optimization.* Choose a range where the oxygen interference check gases will fall in the upper 50 percent. Conduct the test, as outlined in this paragraph, with the oven temperature set as required by the instrument manufacturer. Oxygen interference check gas specifications are found in § 89.312-96(d).

(1) Zero the analyzer.

(2) Span the analyzer with the purified synthetic air specified in § 89.312-96(b)(4).

(3) Recheck zero response. If it has changed more than 0.5 percent of full scale repeat paragraphs (d)(1) and (d)(2) of this section to correct problem.

(4) Introduce the 5 percent and 10 percent oxygen interference check gases.

(5) Recheck the zero response. If it has changed more  $\pm 1$  percent of full scale, repeat the test.

(6) Calculate the percent of oxygen interference (designated as *percent O<sub>2</sub>I*) for each mixture in paragraph (d)(4) of this section.

$$\text{percent O}_2\text{I} = \frac{(B - C)}{B}(100)$$

A=hydrocarbon concentration (ppmC) of the span gas used in paragraph (d)(2) of this section.

B=hydrocarbon concentration (ppmC) of the oxygen interference check gases used in paragraph (d)(4) of this section.

$$C = \text{analyzer response (ppmC)} = \frac{A}{D}$$

D=percent of full-scale analyzer response due to A.

(7) The percent of oxygen interference (designated as *%O<sub>2</sub>I*) must be less than  $\pm 3.0$  percent for all required oxygen interference check gases prior to testing.

(8) If the oxygen interference is greater than the specifications, incrementally adjust the air flow above and below the manufacturer's specifications, repeating paragraphs (d)(1) through (d)(7) of this section for each flow.

(9) If the oxygen interference is greater than the specification after adjusting the air flow, vary the fuel flow and thereafter the sample flow, repeating paragraphs (d)(1) through (d)(7) of this section for each new setting.

(10) If the oxygen interference is still greater than the specifications, repair or replace the analyzer, FID fuel, or burner air prior to testing. Repeat this section with the repaired or replaced equipment or gases.

#### **§ 89.320-96 Carbon monoxide analyzer calibration.**

(a) Calibrate the NDIR carbon monoxide as described in this section.

(b) *Initial and periodic interference check.* Prior to its introduction into service and annually thereafter, the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO<sub>2</sub> in accordance with § 318.96(b).

(c) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter, the NDIR carbon monoxide analyzer shall be calibrated.

(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each used operating range with carbon monoxide-in-N<sub>2</sub> calibration gases having nominal concentrations starting between 10 and 15 percent and increasing in at least six incremental steps to 90 percent of that range. The incremental steps are to be spaced to represent good engineering practice. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(d) The initial and periodic interference, system check, and calibration test procedures specified in part 86, subpart D of this chapter may be used in lieu of the procedures specified in this section.

**§ 89.321-96 Oxides of nitrogen analyzer calibration.**

(a) The chemiluminescent oxides of nitrogen analyzer shall receive the initial and periodic calibration described in this section.

(b) Prior to its introduction into service, and monthly thereafter, the chemiluminescent oxides of nitrogen analyzer is checked for NO<sub>2</sub> to NO converter efficiency according to § 89.317-96.

(c) *Initial and periodic calibration.* Prior to its introduction into service, and monthly thereafter, the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with NO-in-N<sub>2</sub> calibration gases with nominal concentrations starting at between 10 and 15 percent and increasing in at least six incremental steps to 90 percent of that range. The incremental steps are to be spaced to represent good engineering practice. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(d) The initial and periodic interference, system check, and calibration test procedures specified in part 86, subpart D of this chapter may be used in lieu of the procedures specified in this section.

**§ 89.322-96 Carbon dioxide analyzer calibration.**

(a) Prior to its introduction into service, and monthly thereafter, the NDIR carbon dioxide analyzer shall be calibrated as follows:

(1) Follow good engineering practices for instrument start-up and operation.

Adjust the analyzer to optimize performance.

(2) Zero the carbon dioxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with carbon dioxide-in-N<sub>2</sub> calibration or span gases having nominal concentrations starting between 10 and 15 percent and increasing in at least six incremental steps to 90 percent of that range. The incremental steps are to be spaced to represent good engineering practice. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(b) The initial and periodic interference, system check, and calibration test procedures specified in part 86, subpart D of this chapter may be used in lieu of the procedures in this section.

**§ 89.323-96 NDIR analyzer calibration.**

(a) *Detector optimization.* If necessary, follow the instrument manufacturer's instructions for initial start-up and basic operating adjustments.

(b) *Calibration curve.* Develop a calibration curve for each range used as follows:

(1) Zero the analyzer.

(2) Span the analyzer to give a response of approximately 90 percent of full-scale chart deflection.

(3) Recheck the zero response. If it has changed more than 0.5 percent of full scale, repeat the steps given in paragraphs (b)(1) and (b)(2) of this section.

(4) Record the response of calibration gases having nominal concentrations starting between 10 and 15 percent and increasing in at least six incremental steps to 90 percent of that range. The incremental steps are to be spaced to represent good engineering practice.

(5) Generate a calibration curve. The calibration curve shall be of fourth